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ABSTRACT

American society is moving from an industrial age to an electronic, information age, and during the next decade both individuals and industry will have to cope with this transition. Effectiveness in dealing with the impact of technology will depend upon the ability of individuals to address four issues: (1) preparing for increased work productivity; (2) coping with anger in a computerized world; (3) understanding classes of human error; and (4) identifying electronic myths. (Methods for addressing each of these issues are briefly discussed. A bibliography for technological literacy and adjustment is appended.) (BL)

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Impact and Implications of Technological Change on Individuals and Industry

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ABSTRACT

This is one of the most important problems of the next decade i.e. coping with transition into a complex technological era. We are only beginning to understand the implications of high technology and our need to adjust to on-going change. Presentation Objectives: (a) to overview implications for individuals and industry; (b) to focus on means and methods for addressing technological issues; (c) to provide recommendations and reading materials to enhance technological literacy and adjustment. Content Areas: Preparing for increased work productivity, Coping with anger in a computerized world, Understanding classes of human error, and Identifying electronic myths. Outcomes for those Attending: (a) increased awareness of problems and opportunities facing professionals during the transition to newer technologies; (b) part-lecture and part-audience interaction; (c) recommendations and bibliography for technological literacy and adjustment.

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Introduction:

We are in a transition period from an industrial age to an electronic one. The moving force is information. It has propelled a number of unique products and systems forward such as computers, communication networks, and advanced manufacturing technologies. With these developments, there is a growing need to examine the impact and implications of technological change on individuals and industry.

My goal today is briefly to cover the impact of high technology on employees, employers, and industry. The information revolution simultaneously presents problems and offers opportunities. It is argued that effectiveness in dealing with the impact of technology will depend, in part, upon addressing four issues: (a) preparing for increased work productivity, (b) coping with anger in a computerized world, (c) understanding classes of human error, and (d) identifying electronic myths. Before examining these issues, a brief view of

technology's genealogy and progress follows:

The world's first electronic computer was the Electronic Numerical Integrator and Computer called ENIAC. It weighed 30 tons, and ran on 18,000 vacuum tubes. Now, we use microelectronic chips (the size of your fingernail) inside devices to make them intelligent. The logic put on a chip is called a central processing unit. It is the part of the computer that makes calculations, and executes programs. The computer-on-a-chip can make almost any small product a smart and powerful device.

This technology has developed in many directions. Through communication networks, information can be transmitted over long distances quickly. It is now possible to key into large data banks and have instant information. Imagine having the Library of Congress on-line. In manufacturing areas, attention has been directed toward using robots for more complex tasks such as electric motor assembly. I would expect hybrid technologies to emerge between communication networks and manufacturing. We are already experiencing computer aided design (CAD) and computer aided manufacturing (CAM) linked together. CAD has allowed a 6:1 reduction in labor. When CAD and CAM are more integrated, the ratio could go as high as 50:1. The greatest realization of computer applications, communications and robots will be felt in our places of work. The effectiveness in dealing with the impact of technology will depend, in part, upon an active examination of certain issues. One issue is that of preparing for productivity.

Preparing for Productivity:

Computerizing the workplace means that things will be done differently. There will be changes in office, factory, and home. Equipment, procedures, personnel, and environmental changes are expected. We will modify our environment so much that we will need to modify ourselves to exist in this new environment. Equipment will be highly flexible and complicated. By 1990, at least 300,000 clerical jobs will be lost as the word processor has a greater impact on offices. We will continue to observe that demands for programmers will outstrip supply. There are a number of implications to consider. Office jobs, retail positions and support service will require a working knowledge of software. There will continue to be a need for more highly trained personnel and frequent re-training of them. The present reality is that the concept of "user-friendliness" in hardware and software is in the eye of the beholder. The present and future reality is that systems will be user-friendly for those having both schema and training to comprehend them.

Productivity will be computer aided; however, there will still be a need to prepare people psychologically for productivity. For example, people facing job expansion will need help to structure their daily work environment to improve both productivity and their attitudes about it. Employees facing job fragmentation may denounce repetitive work. Training and skills will continue to be needed to aid productivity. The computer is master at processing bushels of information at lightning speed

but if the information is wrong there is no advantage gained. If the computer is down, employees will need to use their time productively. The fastest computer will not make a poorly managed firm more efficient. Computers will not make management problems go away. Management will still need to provide tangible evidence for itself and for employees' productive performance. Having state-of-the-art equipment is only one antecedent to productivity. Productivity also involves leadership ability to motivate self and others under the best and even under the worst of times.

Coping with Anger:

What do you do when things go wrong? It has been said that a computer can make as many mistakes in two seconds as 20 people working 20 years make. What do you do when it all goes wrong? On the West Coast, one deputy sheriff shot the police department's computer. Management will be confronted with all sorts of strange things when employees seek ways to release anger. It may be hard to differentiate abuse from either misuse or unintended accidents. For example, there is little hope for a keyboard or disk drive victimized by someone spilling Coke on it. Employees may praise the machine one day and feel like putting their chair through the screen the next day. One temptation is to treat such problems as if they were entirely of the employees own making. Equipment failures and errors may elicit varied emotional responses from employees. How emotions are handled is a thought provoking issue for counselors. It is important to recognize that equipment failures and errors do not

always originate from human failures. Surges in electricity can damage computers. Airborne dust can cause disk errors. Electronic problems can occur from hardware and software incompatability labeled as interfacing problems. Some diskettes, regardless of proper care, can simply go bad. What can be done? One possible defense is that of creating stored emotional capital in the employee and anticipating some form of it from others. How does this come about? Simulated equipment failures, errors and various problems should be faced in training environments. People need opportunities to sort out how to cope with their emotions under trying circumstances in simulated work environments. It may also be necessary through posters and modeling to display clear preferences for self-control, humor, sensitivity or lack of it, caring or degrees of caring, flexibility, courage and problem recognition. Reference systems are needed for people to help them cope with their emotions in a computerized environment. Here are a few examples of poster text:

1. When a whole day's work vanishes because you forgot to use a Save Command then sadness may be a natural response to such a loss but... don't overdo it.
2. A failure will not appear till a unit has passed final inspection.
3. In a world where death is the hunter, there is no time for bad moods.
4. All great discoveries are made by mistake.

Understanding Classes of Human Error:

In the early stages of learning about a complex system, one can count on some bad moods and on human error. For a computer naive learner, much happens according to Murphy's Law. For

example, "if there is a possibility of several things going wrong the one that will cause the most damage will be the one to go wrong." Let me digress here and note that the first reference in your bibliography is titled, Official Computer Hater's Handbook. The last reference is titled, Nailing Jelly to a Tree. I have also added a few references on self-control and self-reward. This was intentional. I am recommending that the bibliography be used as an initial step to develop one's technological literacy and adjustment. Learning is frustrating for people not experienced with computers. Menu driven help prompts do not always help. There are a variety of classes of human errors. One class of error is simply lack of basic knowledge. Another class is that of making ad hoc interpretations. This means that employees are making their own translation for each situation. A third class of error involves generalizing from what one knows but unfortunately the generalization doesn't fit. This means that employees are formulating their own general rules but they may not surmise that the rules are inappropriate. Another class of error is that of not following directions. As Murphy's rule states "When all else fails, read the instructions." Needless to say, one class of error can create another class of error. Problems can interact. There are no simple answers to human error. What can be done? We will need to be clever in training people. We will need more research in error and classification of it on standardized systems. We have a long way to go from here. There is still too little standardization in the industry. We might

also entertain the idea that a perfect man-machine system may not be obtainable.

Identifying Electronic Myths:

We are increasingly an information-based society but our information is not always complete or true. There are myths or popular stereotypes. They are a way of telling ourselves about ourselves. Myths can be misleading especially if you are not aware that you are actually dealing with a myth. Here are a few examples:

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1. Computers are simple, easy to learn systems.
   Try telling that to someone who has never used a computer and is now trying to learn to use one.

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2. You have to be good in math to use technologically advanced systems.
   Explain that to an experienced word-processing operator.

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3. Wait until next year to buy a computer. It will be cheaper, more features....you will be rewarded by waiting.
   On the surface, it looks like a nice deal. Wait, and you will be rewarded. Actually, each year you delay then your introduction to computers is also delayed. You will also be trading away your current use of the equipment. The question is do you wish to pay that price?

What can be done? It takes time to explore the structural elements of myths. It also takes experience and education to recognize that one is dealing with a myth. In some situations, employers and employees may have to seek out technically competent personnel to provide information for the sole purpose of getting close to the truth.

Overview:

For the next decade and onward, the impact of technology will be increasingly felt in our society. But, I submit that the days of indifference toward technology are past. Let us consider that whatever we think of computers or robots, it boils down to the precise equivalent of slave labor. Labor that competes with slave labor will probably find itself accepting the same economic conditions as slave labor. This clearly poses unemployment, economic, and psychological problems. Time is needed to elapse before full implications are understood in the work sector. In this brief presentation, a number of issues, problem areas, and implications were identified. I do recommend that the bibliography be used as an initial step to technological literacy and adjustment. The information revolution can spawn new opportunities. There is a need for awareness of social, psychological, intellectual, physical, and economic responsibility to see that the new technologies benefit man. The technological revolution is a two-edged sword. It may enrich society or it may help to destroy it. The impact and implications of technology in the coming years may prove to be both a nightmare and a dream to our way of life.

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